

Fig. 1

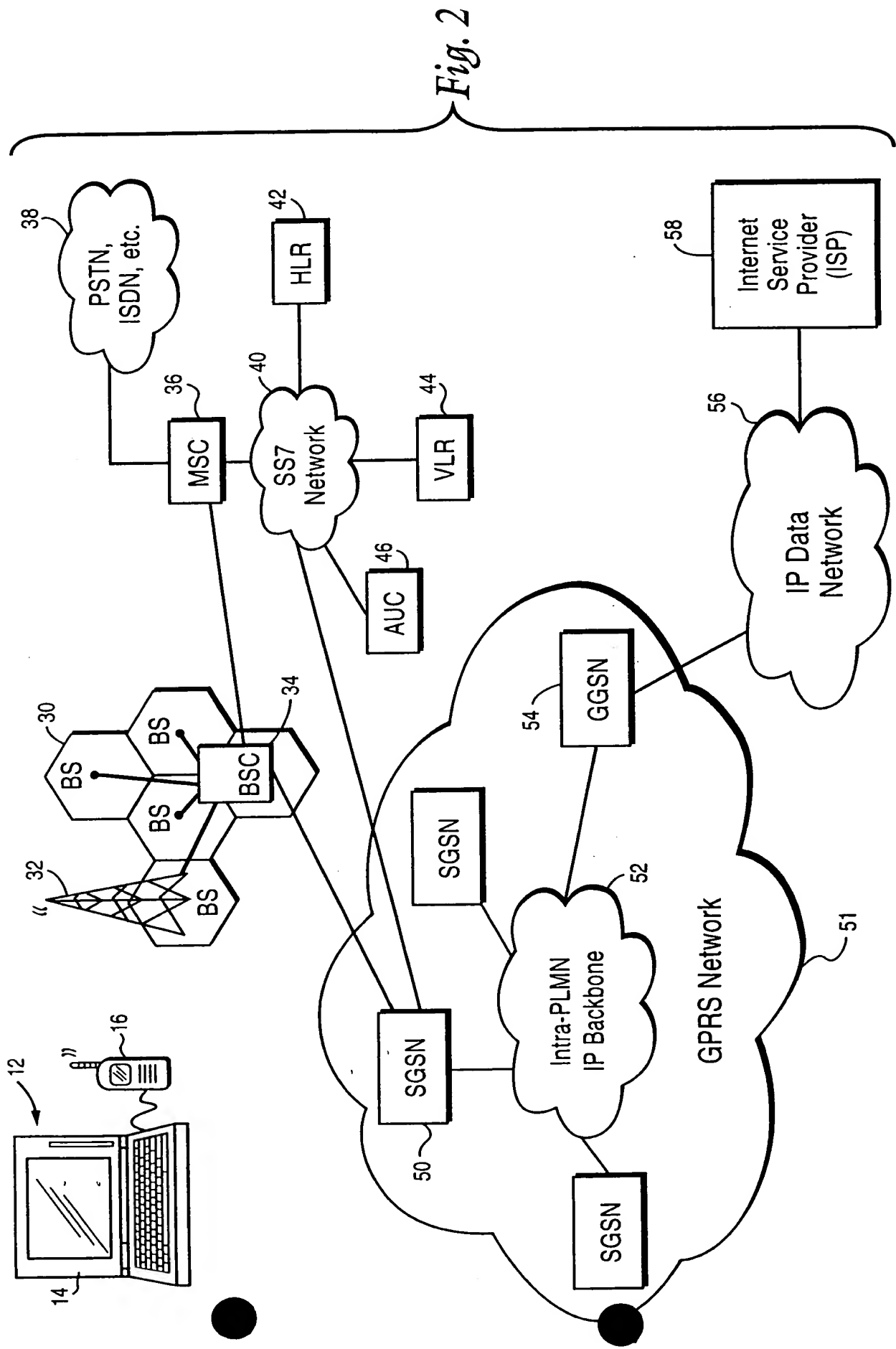


Fig. 2

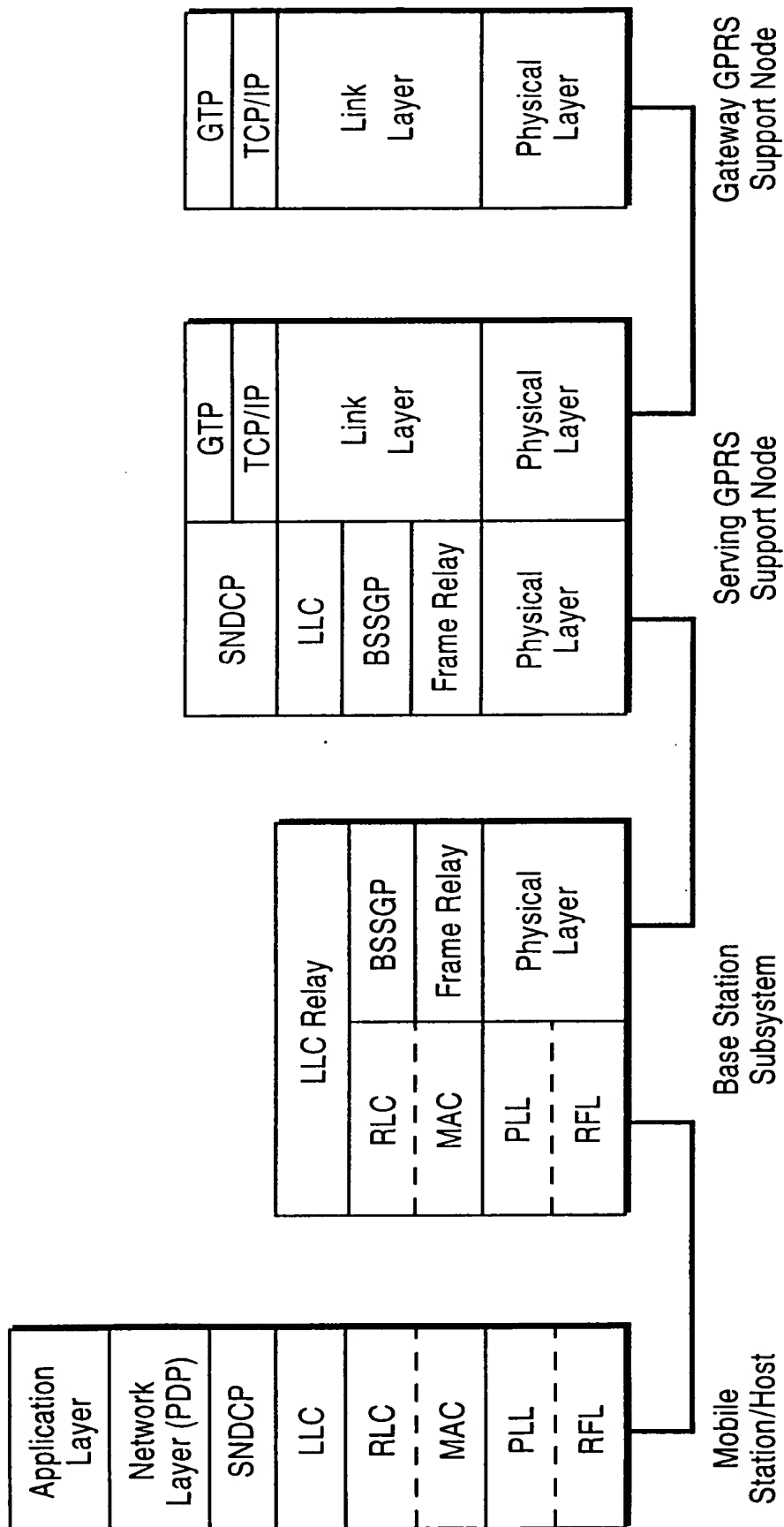


Fig. 3

Fig. 4

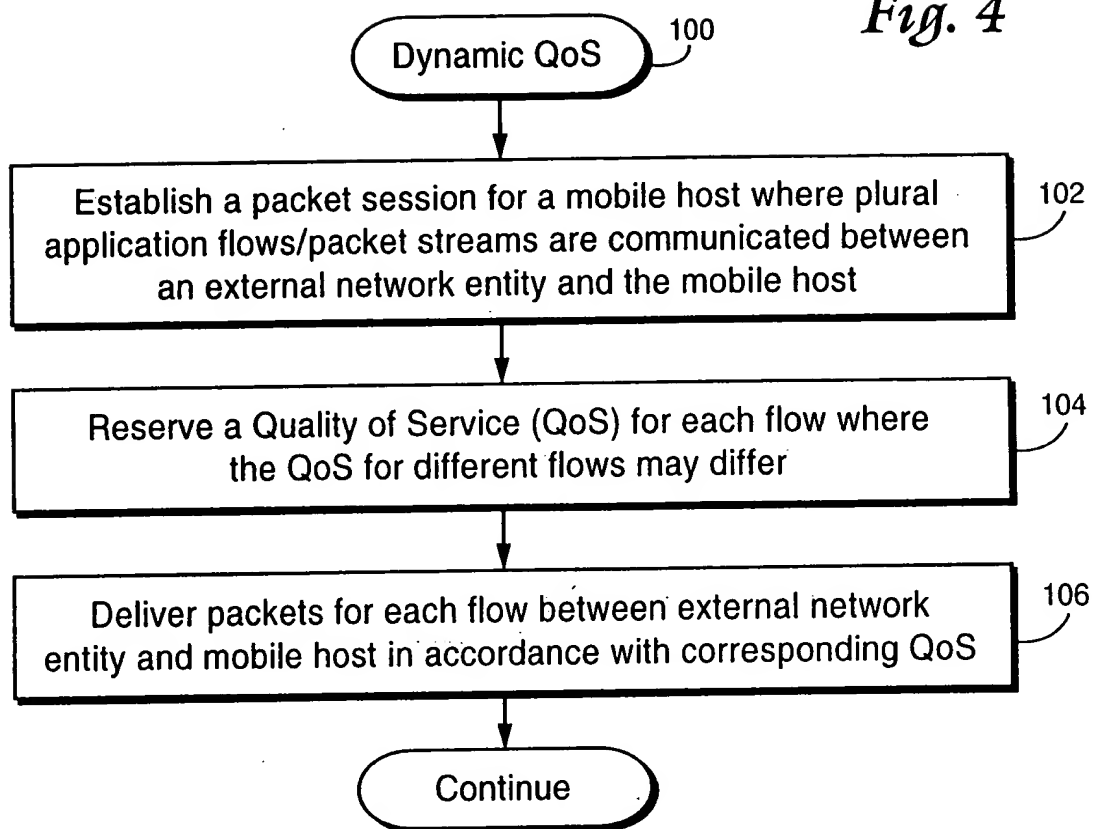


Fig. 5

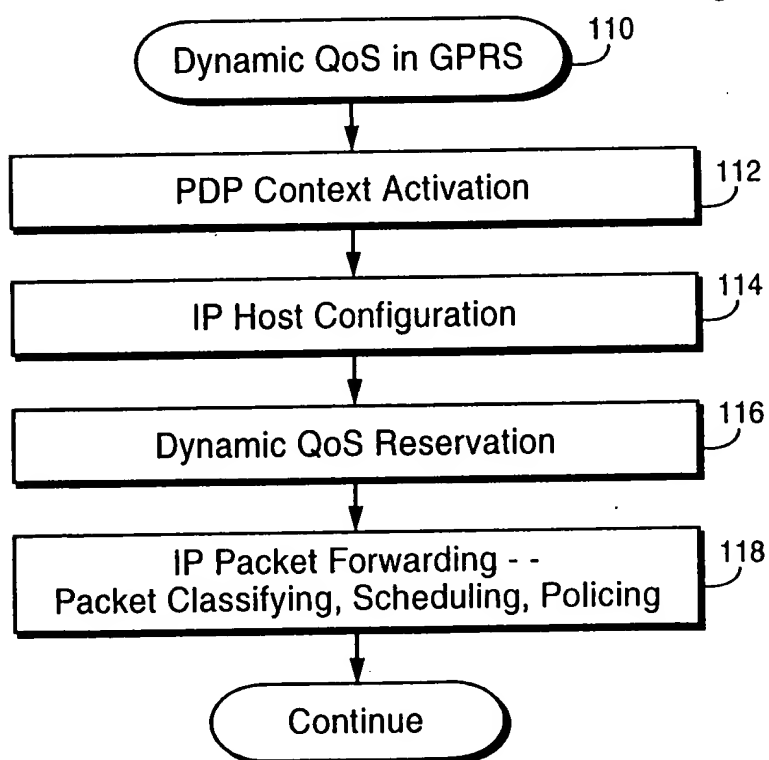


Fig. 6

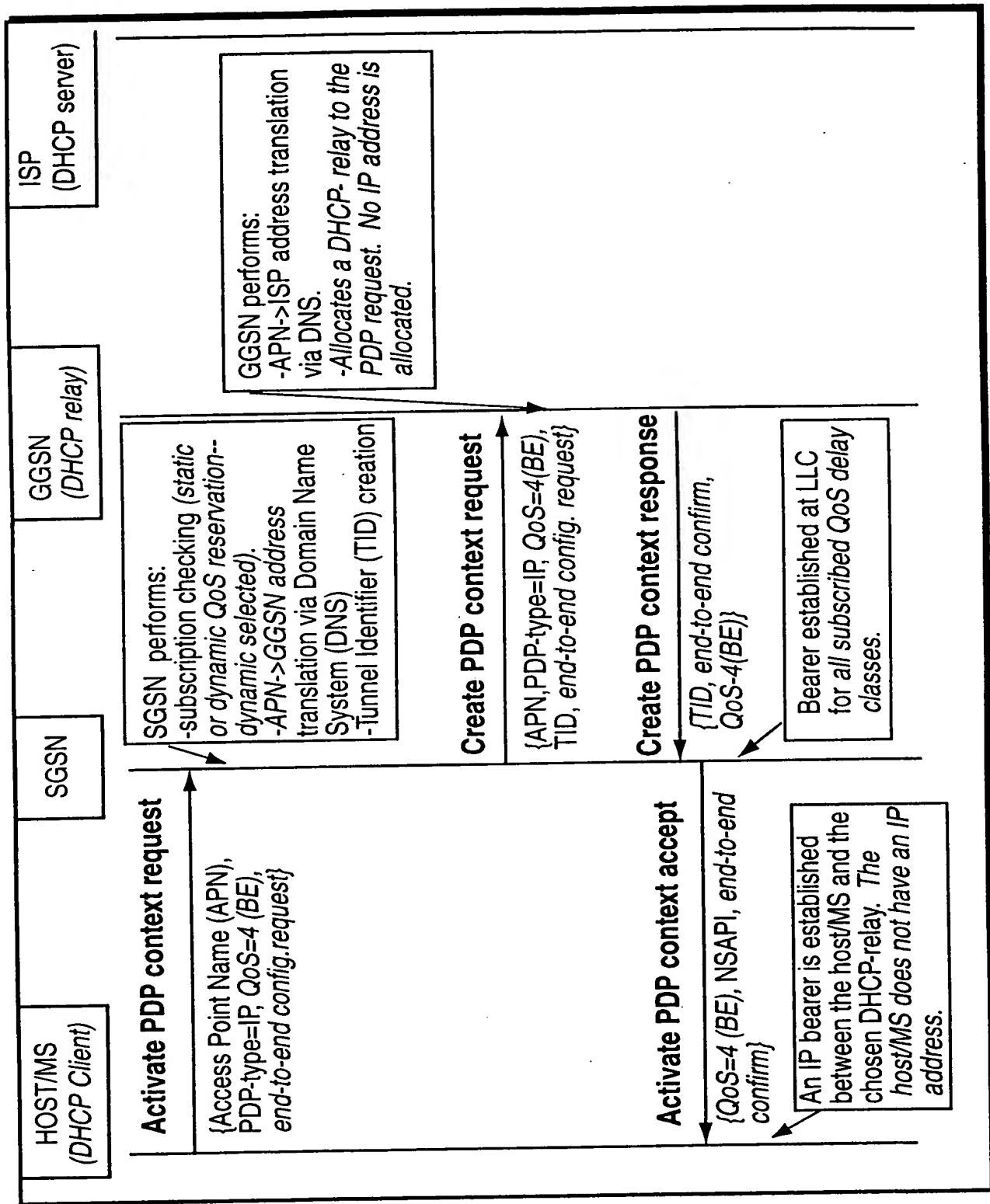
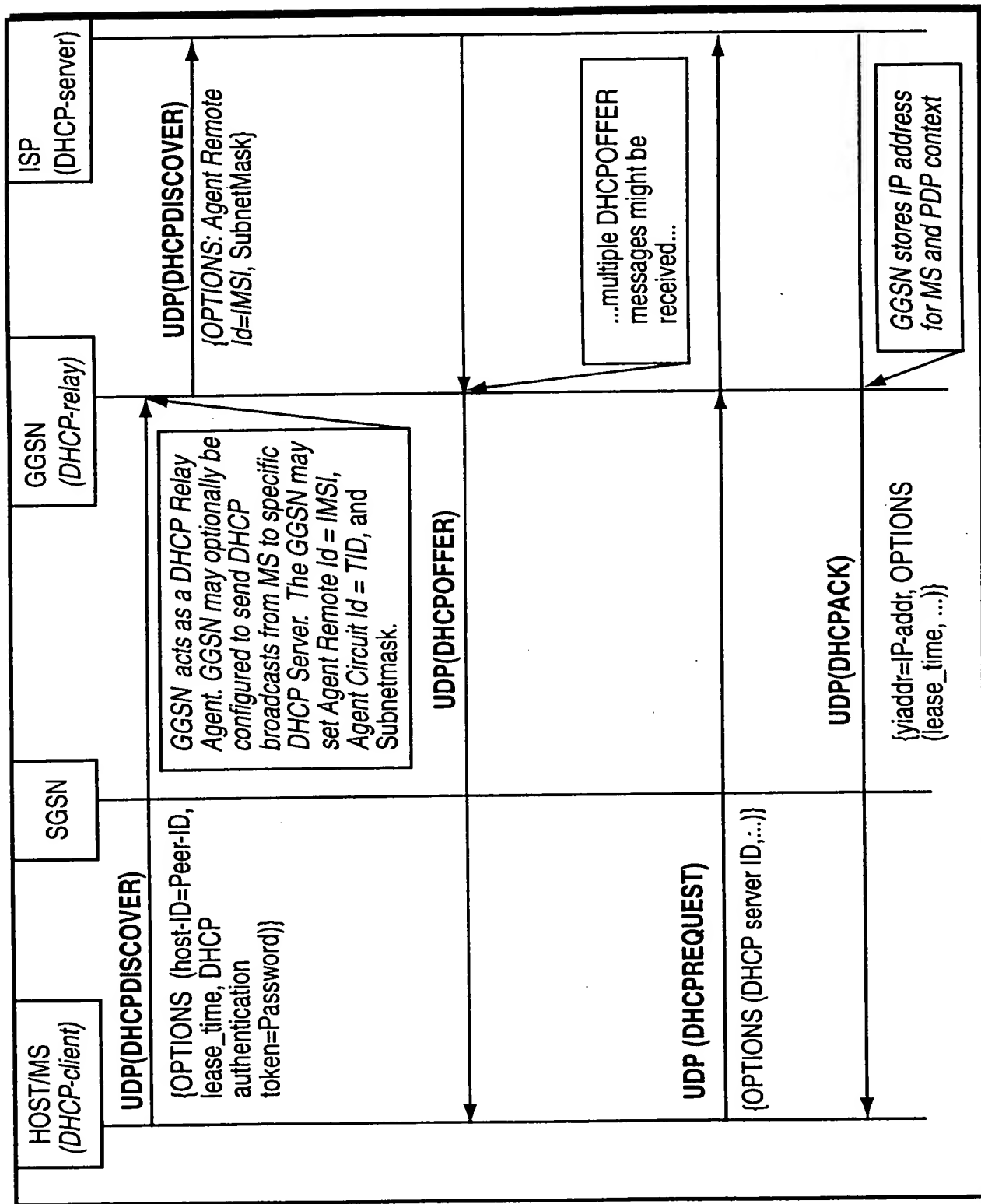


Fig. 7



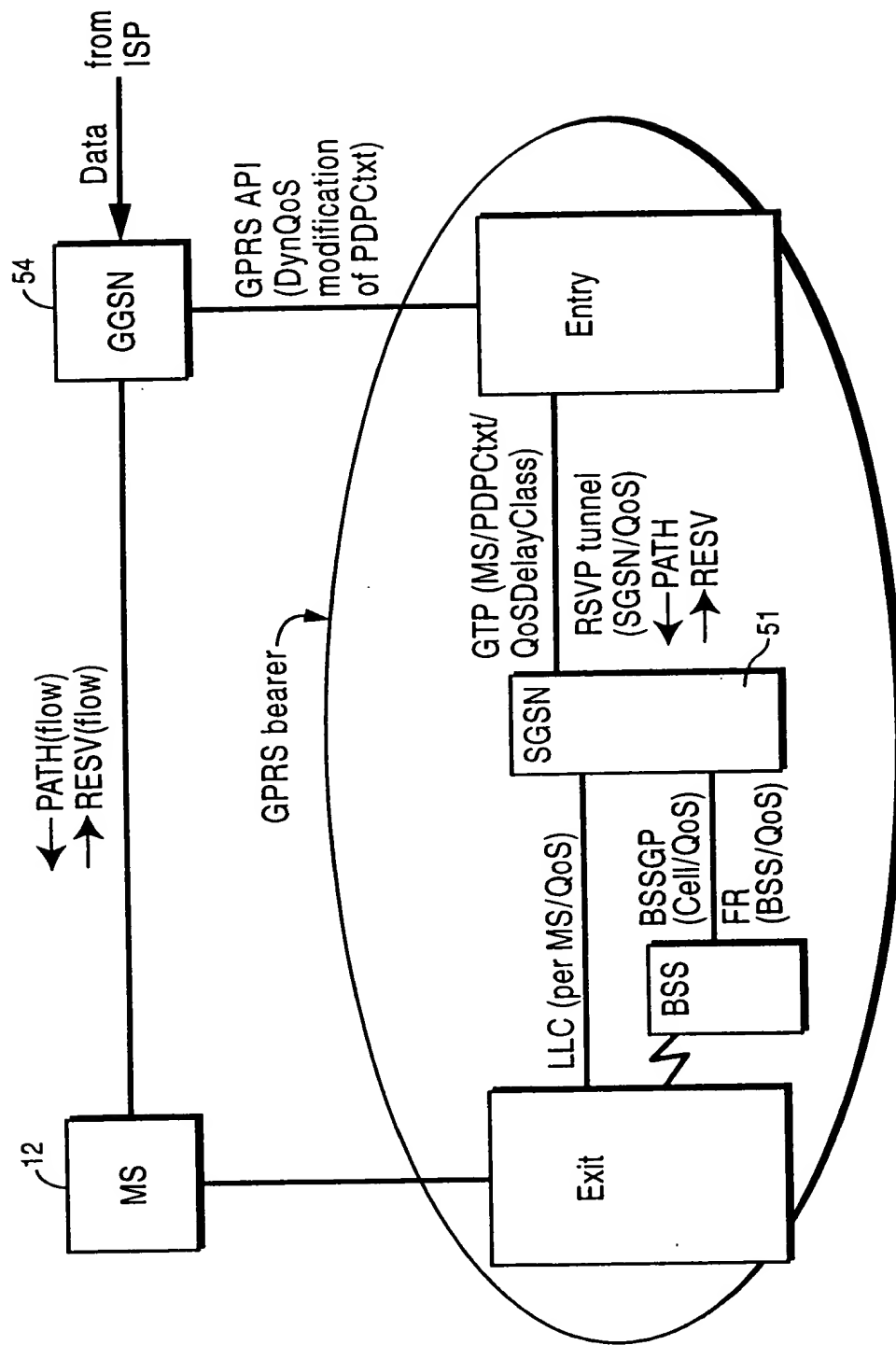
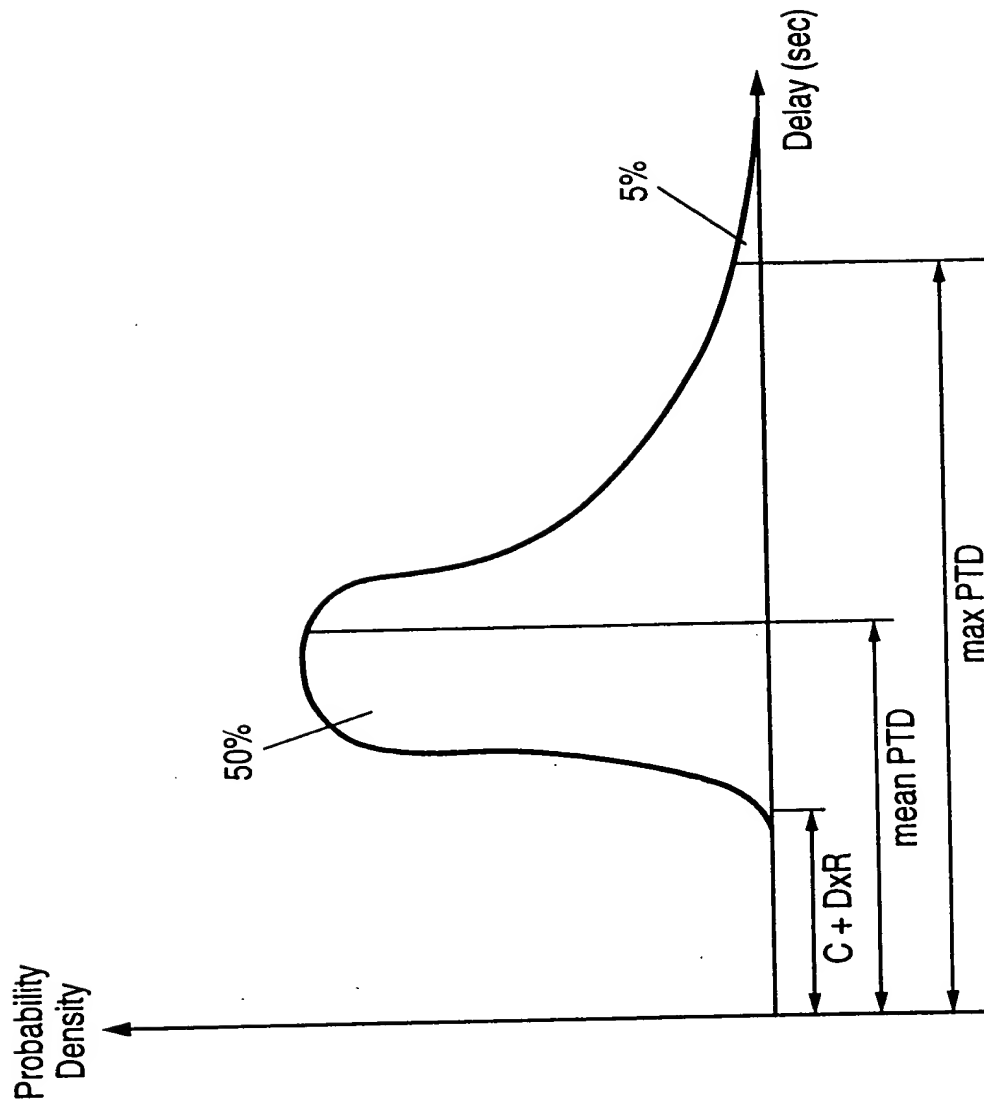


Fig. 8

QoS Reservation: Mobile Terminating Traffic Case.

Fig. 9



Delay Probability Definitions for the GPRS bearer.


```

sequenceDiagram
    participant Host/MS
    participant SGSN
    participant GGSN
    participant ISP

    Host/MS->>SGSN: BSS
    Host/MS->>SGSN: LLC I frame { N(S), N(R), QoS delay class, MSid, downlink }
    SGSN->>GGSN: RSVS PATH { session id, TSPEC }
    GGSN->>ISP: RSVS PATH { session id, TSPEC }
    GGSN->>SGSN: RSVS RESV { FLOWSPEC, FILTERSPEC, session id }
    SGSN->>Host/MS: BSSGP flow control { window per BSC/Cell/QoS, downlink }
    Host/MS->>SGSN: BSSGP flow control ack
    SGSN->>GGSN: GTP update PDP context request { MSid, TID, QoS=x, bw=max/mean bit rate + bucket depth, downlink }
    GGSN->>ISP: GTP update PDP context request { MSid, TID, QoS=x, bw=max/mean bit rate + bucket depth, downlink }
    
```

Host/MS sends **BSS** to **SGSN**.

Host/MS sends **LLC I frame** to **SGSN**.
 { N(S), N(R), QoS delay class, MSid, downlink }

SGSN sends **RSVS PATH** to **GGSN**.
 { session id, TSPEC }

GGSN sends **RSVS PATH** to **ISP**.
 { session id, TSPEC }

GGSN sends **RSVS RESV** to **SGSN**.
 { FLOWSPEC, FILTERSPEC, session id }

SGSN sends **BSSGP flow control** to **Host/MS**.
 { window per BSC/Cell/QoS, downlink }

Host/MS sends **BSSGP flow control** to **SGSN**.
 ack

SGSN sends **GTP update PDP context request** to **GGSN**.
 { MSid, TID, QoS=x, bw=max/mean bit rate + bucket depth, downlink }

GGSN sends **GTP update PDP context request** to **ISP**.
 { MSid, TID, QoS=x, bw=max/mean bit rate + bucket depth, downlink }

Annotations:

- RSVS PATH:** GGSN forwards RSVS Path message towards MS over GPRS QoS=4 (BE) if activated.
- RSVS RESV:** SGSN acts as an ESTIMATOR for QoS delay and monitors all LL-PDU transmissions/acks.
- RSVS PATH:** RSVS POLICY AND ADMISSION CONTROL may be applied. GGSN maps the RSVS request to GPRS and "refreshes" the BW reservation of the GPRS bearer for the particular MS/PDP context/QoS delay class if necessary.
- BSSGP flow control:** BSS acts as an ESTIMATOR and sends regularly capacity reports to the SGSN. The capacity reports reflect currently available radio channel and queue space capacity. SGSN acknowledges.
- GTP update PDP context request:** SGSN performs GPRS ADMISSION CONTROL for the QoS delay class and bandwidth requested for the MS by comparing with available capacity for a certain BSC/Cell/QoS delay class. SGSN allocates, e.g., 20% of available BSS/Cell capacity to the best effort delay class to ensure no extra packet loss for predictive delay flows in the GPRS bearer. HLR subscription data/MS classmark are used for POLICY CONTROL.

SECRET

From Fig. 10A ↑

Fig. 10B

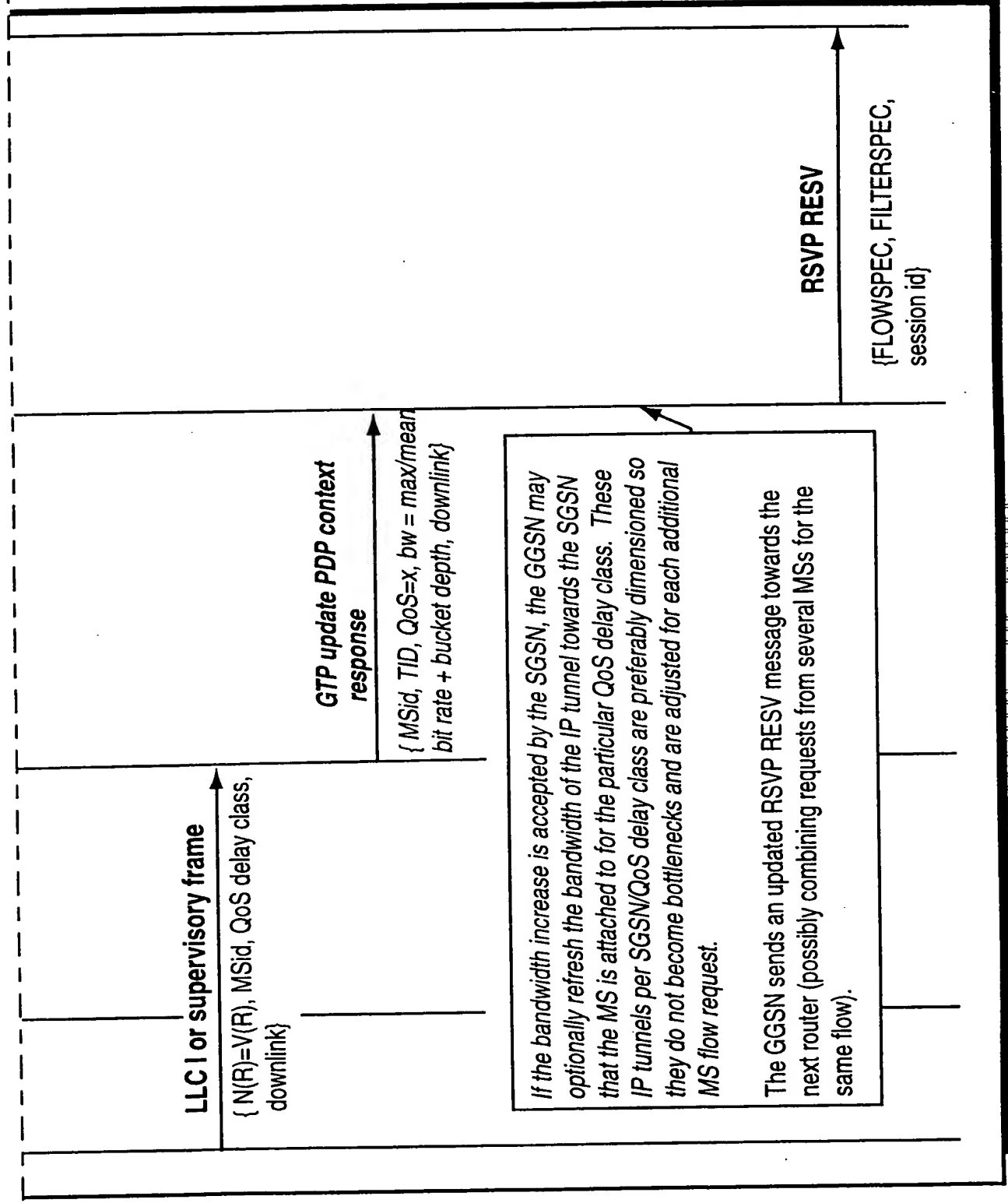


Fig. 11

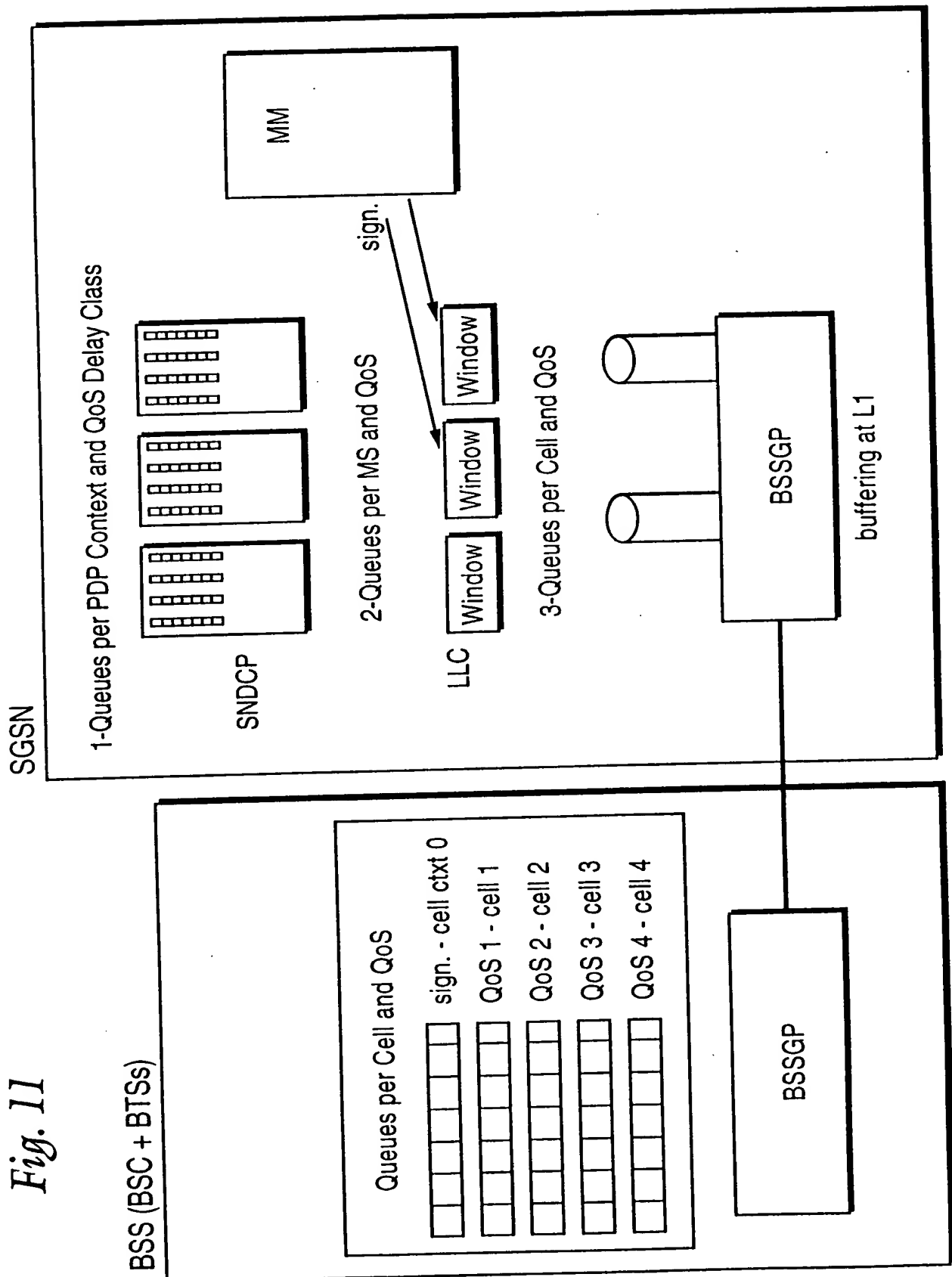


Fig. 12

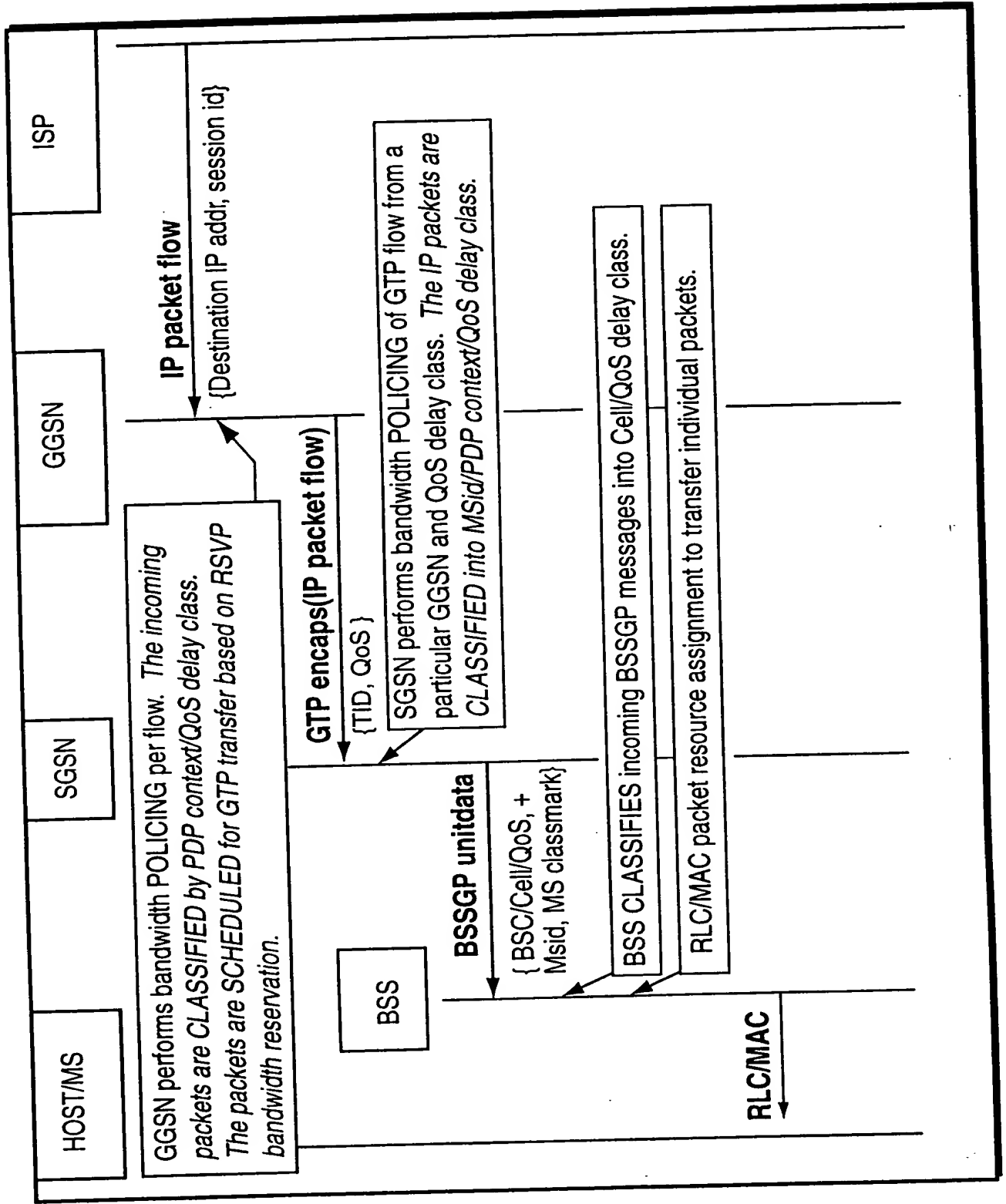


Fig. 13

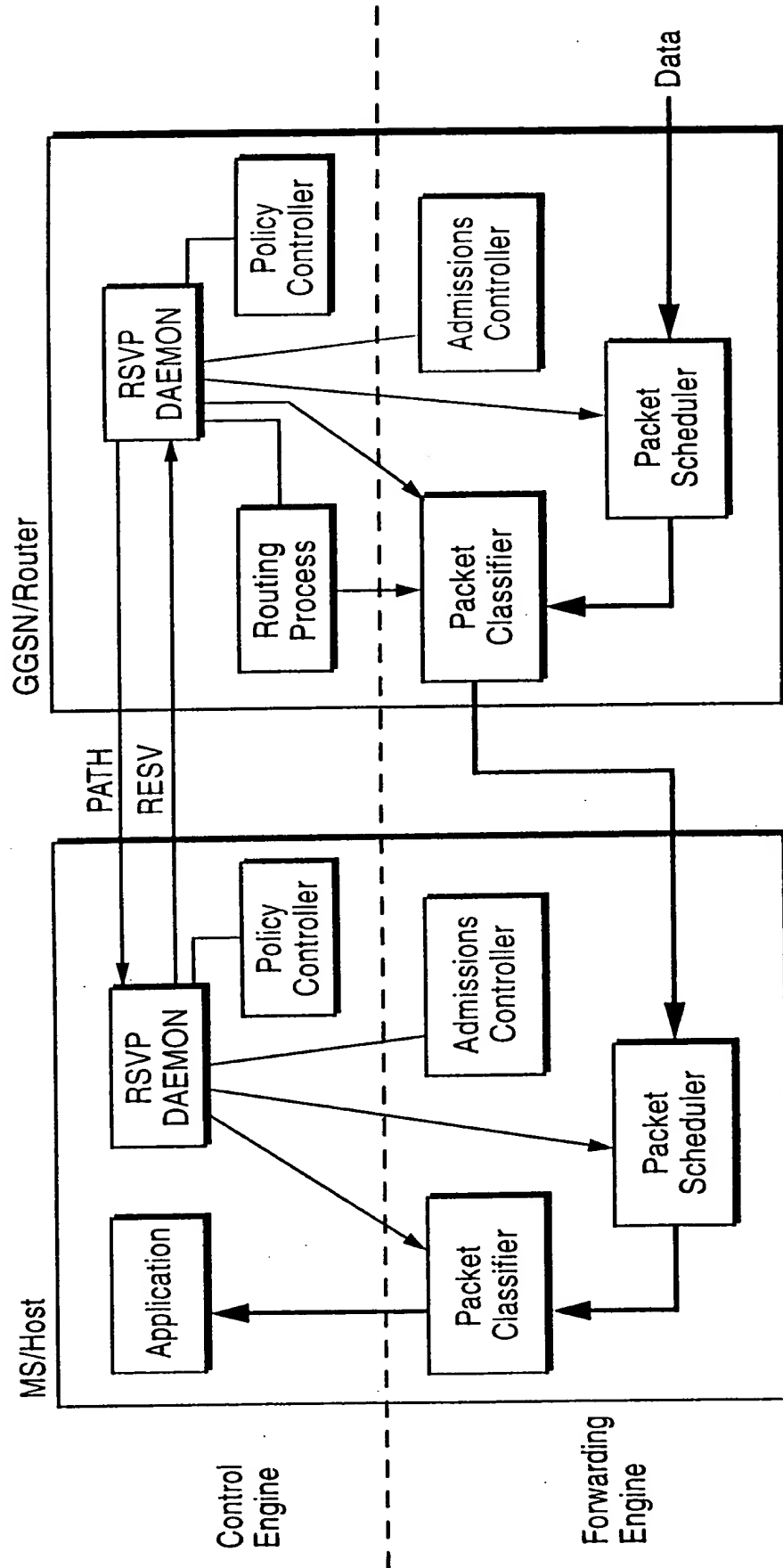


Fig. 14

